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Indian Standard

CODE OF PRACTICE FOR SELECTION, OPERATION AND MAINTENANCE OF FIRE FIGHTING APPLIANCES

PART III TURNTABLE LADDER

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CODE OF PRACTICE FOR SELECTION, OPERATION AND MAINTENANCE OF FIRE FIGHTING APPLIANCES
PART III TURNTABLE LADDER

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CODE OF PRACTICE FOR SELECTION, OPERATION AND MAINTENANCE OF FIRE FIGHTING APPLIANCES

PART III TURNTABLE LADDER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 May 1975, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Even the best designed power/mechanically operated/hydraulic turntable ladder will not serve the purpose for which it is intended unless it is correctly employed and operated and regularly maintained. This fact emphasizes enormous care and gives greater importance for the appliance which is meant for special use as a water tower, or for rescue purpose either as a staircase by lowering a person in a string from the head of the ladder. Turntable is one of such appliances.

0.3 Although there are several makes of turntable ladders in use in this country, those widely used are either mechanically operated or hydraulically operated turntable ladders. Where as the principles for the selection, operation and maintenance of all such appliances are more or less based on the same principles, though details vary. The recommendations in this standard have, therefore, been framed particularly for the turntable ladder mechanically operated and in general hydraulic turntable ladder. Keeping in view the necessity of adequate manpower requiring handling of such appliance, necessary recommendations for this has been included in this standard.

0.4 This standard is formulated in four parts: Part I covers Combined foam CO_2 crash tender, Part II Escape, Part III Turntable ladder and Part IV Other equipments like hose pipe, extension ladder, etc (*under preparation*).

0.5 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

1. SCOPE

1.1 This standard covers the recommended practice and procedures for the selection, operation and maintenance of combined mechanically operated turntable ladder and hydraulic turntable ladder.

2. GENERAL

2.1 Turntable ladders shall be provided in metropolitan cities or at other places for fighting the fires in high rise/tall/multi-storeyed buildings, oil installations where water or foam is intended to be used as the principal fire extinguishing medium as a water/foam tower. It may also be used for rescue purposes either as 'staircase' or by lowering a person in a sling craddle from the head of the ladder where means of escape are blocked by smoke heat and fire or otherwise.

3. SCALE

3.1 Turntable ladders shall be provided according to the size of fire risk as described under **2.1** in any of fire stations jurisdiction subject to minimum two numbers.

4. HOUSING

4.1 Turntable ladders shall be housed at the fire station covering multi-storeyed and or oil installations above ground fire risk.

4.2 Turntable ladders shall not be stationed exposed to weather except for the duration of drills demonstrations or operational purposes.

5. MANPOWER

5.1 A crew of six trained men shall be provided to man each appliance. The crew shall comprise one officer-in-charge of the appliance, four firemen and one driver operator.

NOTE — Training should include complete familiarization with the working of the appliance, its capabilities, operation and maintenance, emergency procedures, fire fighting techniques and topography of the multi-storeyed buildings, oil tanks and involved water resources for the purpose of fire fighting.

5.2 It shall be ensured that the full crew recommended in **5.1** is available for instantaneous turn-out round the clock, when the appliance is required.

6. WATER SUPPLY

6.1 Adequate water supply in the shape of static water tanks and hydrants shall be provided for boosting pumps to be operated for a required duration, without interruption to its full rated output/capacity.

6.1.1 Additional water supply for the purpose of **6.1** shall be carried on water tenders.

6.1.2 Each water tender shall be manned by its full complement of crew who shall be available for instantaneous turnout at all times when the turntable ladder is turned out.

6.2 The static tanks shall be designed and sited to ensure that:

a) the capacity of each tank is of at least 200 000 litres,
b) there are adequate arrangements for speedy replenishment of each tank at the rate of 2 275 l/min,
c) manhole of each tank shall be within direct approach of fire engines without any kind of obstruction,
d) the coverage of the tank shall be capable of withstanding the weight of at least 12 tonnes, and
e) no tank shall be more than 100 m away from the risk it is intended to cover.

6.3 The fire hydrants shall be conforming to IS : 908-1975*.

6.4 Supplies of adequate foam compound conforming to IS : 4989-1974† shall be provided for replenishing the foam equipment by water tenders or other transport.

7. SPARE PARTS

7.1 Adequate spare parts for the maintenance of the chassis, engine pump, ladder mechanism, ratio telephone and life saving equipment shall be provided at each station.

8. ACCESS ROADS

8.1 For a turntable ladder to be effective in fire fighting and rescue operations of multi-storeyed buildings, it should be able to reach the building, oil tank sites as near as possible and as expeditiously as possible. This can be achieved by providing sufficient open space of at least 8·5 m width around the object necessary for clear and speedy manoeuverability of the appliance. At least 4 m wide entrance and exitways shall also be provided.

9. OPERATION

9.1 The turntable ladder may be operated for any of the following:

a) As a water tower taking water from additional water tenders, static tank, hydrants;

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*Specification for fire hydrant, stand post type (*second revision*).

†Specification for foam compound for producing mechanical foam for fire fighting (*first revision*).

b) Delivery of foam jets taking water and foam compounds mixed with available mechanical foam producing apparatus;

c) For bridging to carry the rescued person down;

d) As a 'staircase' for rescue purposes;

e) As a crane to lift the loads; and

f) As a string for taking down the trapped persons from heat to ground.

9.2 General — The following shall be checked at the beginning of each tour of duty by the incoming crew:

a) *Engine Radiator Tank* — These shall be kept full.

b) *Fuel Tank* — It shall be kept full.

c) *Tyres* — These shall be checked for correct inflation. The correct pressure given in the instruction manual for the chassis shall be painted on the outside of mudguards, above the tyres, in white paint, so as to ensure correct and ready means for checking.

d) *Oil Level in Engine Sump* — It shall be up to the mark for correct level on the dip stick.

e) *Battery* — It shall be topped up with distilled water and the specific gravity of the electrolyte shall be checked. Connections between the battery terminals and the electrical circuits shall be checked to ensure that these are tight.

f) *Lights, Horn, Fire Bells* — These shall be put in good working order.

g) *Auxiliary, Ancillary and Optional Equipment* — It shall be ensured that all the equipment is in efficient working condition.

h) *Turntable Rotation Rings* — Lubrication by grease be ensured.

j) *Rotation Work Box* — It shall be up to correct oil level mask on the dipstick.

k) *Extension Winch Gear Box* — The oil level shall be maintained up to the oil level plug provided on the casing.

m) *Ladders* — It shall be ensured that the ladders are free from rust and paint work is undamaged. The ring covers shall not be allowed to wear or damaged.

All wire ropes and pulleys shall be seen for any broken strands which will show up in the form of ' needling '. If it be so ensure that the rope has been replaced with correct diameter and construction.

n) *Ladder Rollers and Pulley* — Correct lubrication shall be carried out.

p) *Hydraulic Oil Tank* — It shall be kept full up to filler pipe.

q) *First-Aid Hose-Reel* — The first-aid hose-reel shall be checked to ensure that it rotates freely and that the tubing is correctly wounded.

r) *Ancillary Equipment* — It shall be checked with the inventory lists for correctness of quantity and stowage.

9.3 Other Factors

a) The turntable ladder operator should work to the inclinometer. The elevation should be restricted to 70 degrees when the ladder is in use water tower to reduce the backward thrust caused by jet reaction.

b) The plumbing, extension, elevation and depression, extension and housing, rotation of the turntable ladder should be carried out in accordance with manufacturer's instructions.

c) The following principal factors for siting the appliance should be as follows:

   1) The safety limits of the ladder;
   2) The clearance around the heel of, and above, the ladder; and
   3) The condition of the ground.

   NOTE — It should also be remembered that the first objective to which the ladder is pitched may not be the only one required, and a site should therefore be chosen which will allow as many other movements as possible to be carried out.

d) *Working Clearance*

   1) There must be sufficient rooms on each side of the chassis for the jacks to be lowered to the ground. It should be remembered that out-rigger jacks, when put down, will extend beyond the wheel base. Two metre on each side is usually sufficient.
   2) There must be sufficient clearance all round the rear of the appliance for the heel of the ladder to travel round at its maximum projection.
   3) There must also be clearance above the ladder for it to be elevated from the nearest. Some buildings have projections on their lower floors, such as balconies and porticoes, which may make it impossible for the ladder to be elevated, although there is otherwise adequate clearance all round.

   NOTE — A turntable ladder should only be operated on firm ground. The ground all round the ladder should be examined, even when it is being operated upon a made-up road, to ensure that there are no hydrant pits, telephone or manhole covers, or similar plates beneath either the road wheels or the jacks. This is particularly important when working in the forecourts of the factories or the drives of private houses. There are invariably several covers in such places (to provide inspection pits to the various domestic services), and these are often partially covered by gravel or other surfacing material, thus making them difficult to distinguish.

e) *Getting to Work*: Prior to getting to work ensure that the jacks are lowered to the ground firmly and the axles are locked. The various operations entailed in getting the turntable ladder to work follow a definite sequence, which must always be adhered to irrespective of the type of ladder employed. This is as follows:

   1) Elevate the ladder to the required angle.

   2) Train the ladder to the ground position.

   3) When the head of the ladder is aimed correctly at the objective the plumbing must be checked and the ladder plumbed as necessary if the plumbing is not automatic.

   4) Check the training and elevation to ensure that the ladder is aimed correctly at its objective, and read off the maximum permissible extension from the inclinometer scale. It is essential to get the elevation as correct as possible before extending, in order that the correct maximum extension may be seen. If the ladder is extended to its maximum and has subsequently to be depressed it may have to be shortened to keep it within permissible limits. It is therefore desirable to obtain a correct angle of elevation before extending.

   5) Extend the ladder. When the required extension is achieved rest the ladder on the pawls.

   6) Adjust training, elevation and extension to obtain the exact position required. These fine adjustments should be carried out in slow speed (as must all operations at or near maximum extension). If the head of the ladder is out of the operator's sight a man should be stationed in a position from which he can see the head, and the operator should work under his instructions. Alternatively, if the head of the ladder is out of sight from the ground (if it is hidden by smoke, for example) a man may be sent to the telephone. Delicate adjustments can, if necessary, be carried out by means of manual gears.

f) *Make Up*: A similar sequence should be followed in making up the ladder:

   1) Bring the head of the ladder clear of the building, normally by training, but if necessary (as for example, when the head of the ladder has been inserted into a narrow opening) by elevating.

   2) House the ladder by first extending the ladder lightly to trip the pawls. The operation should be commenced in slow speed, but as soon as it is apparent that the pawls on all three extensions have cleared correctly, the lever may be gradually depressed, thus releasing the brake, and allowing the ladder to descend more rapidly.

3) Train the ladder into the central position over the appliance.

4) Depress the ladder to within a few metres of the headrest (these last two operations are usually carried out simultaneously).

5) Bring the table on the central point before depressing it on the gallows.

6) Depress the ladder on to the headrest, watching carefully to see that it does not foul the horns on either side. If it appears likely to foul, it should be elevated, trained slightly in the required direction and then depressed again.

9.4 Using as a Water Tower; Taking Water from the Tender Static Tank Hydrant — This operation may be necessitated when fighting fire in high rise buildings or when carrying out routine drills at the fire station. It may also be required to apply foam to the oil tankers with a view to prevent an outbreak of fire while normal operations are in progress. When fighting a high rise building fire the appliance shall be parked according to the procedure given in **8** and the engine shall be kept running. When carrying out the drill, it may be parked as required. In any case, jacks and axle along mechanism shall be applied to the appliance before commencing the operations, unless it is necessary to move for the purpose of obtaining the more advantageous position for attacking the fire.

9.5 When the pump is engaged the rev/min should not exceed the manufacturer's instructions laid in their manual.

9.6 A pressure of 0·7 MN/m^2 (7 kgf/cm^2) shall be built up on the pump and shall be maintained at this level, as the delivery is opened up by manipulating the throttle.

9.7 The delivery monitor shall be opened to the fire as necessary.

9.8 At close of operations (*see* Table 1 and **9.2**) the used delivery hoses and other equipments shall be thoroughly washed with fresh water.

9.9 The pump delivery cutlets in use shall be opened after building up adequate pressure at the pump. The actual pressure will depend on the size of nozzle in use.

9.10 Weekly maintenance routine is given in Table 1.

9.11 Where First-Aid Hose-Reel is Used — This operation may be necessitated when fighting class 'A' fires (*see* IS : 2190-1971*) where indiscriminate use of water is likely to cause water damage or where the size of fire is so small that it does not warrant the use of full sized jets. It may also be useful for producing the desired effect on the public by getting a jet to work within a couple of seconds of the arrival of the crash

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*Code of practice for selection, installation and maintenance of portable first-aid fire appliances (*first revision*).

tender at the scene of fire (particularly a building fire) and till the larger jets could be got to work.

9.11.1 Turntable ladder shall be positioned at the static water supply and necessary length of suction hoses connected up with the strainer attached to the last length. The suction hoses shall be secured with a rope and its strainer and lowered into the water.

9.11.2 Pump shall be engaged and primed with the engine running in accordance with the manufacturer's instructions.

TABLE 1 WEEKLY MAINTENANCE ROUTINE TO BE CARRIED OUT AT THE FIRE STATION

(*Clauses* 9.8 *and* 9.10)

Day of Week	*Details of Task*
Monday	a) All nipples, cross shafts plug, etc, shall be lubricated with grease gun, oil can or by hand as required. b) Telephone working system shall be checked, tested and cleaned.
Tuesday	Ladder rollers, head rollers, pawl boxes, pulleys, plumbing guides, cables, sliding surfaces, chains gears elevation, cross shaft, drum bearings, gear drive to drum guide rods, bevel gear, worm gears, throttle control, ladder lock, jacks, etc, shall be checked and cleaned and lubricated by at rained person.
Wednesday	a) All locker doors, hinges, cab doors, bonnet hinges and catches shall be lubricated using light machine oil. b) Search and spot lights shall be checked for free movement and lubricated as necessary. Cables shall also be checked at the same time. Fire bells shall be checked for correct operation.
Thursday	a) Delivery hoses shall be laid out for airing and all hoses shall be replaced with fresh hoses from the stock. After airing, hoses shall be cleaned, made up and kept in store. b) Ladder shall be checked. Pawls and pulleys shall be lubricated with light machine oil.
Friday	a) Particular attention shall be paid to the presence of stones between tyre treads and mud between the twin rear tyres. b) Ladder shall be tested by portions.
Saturday	a) First-aid hose reel tubing shall be checked and wounded properly and shall be treated with french chalk if necessary. b) Pump shall be tested for priming from the open source of water. c) Engine shall be cleaned. d) All hoses on the appliance shall be replaced with fresh hoses and the ones which are removed shall be tested. All defective hoses shall be repaired. e) Weekly summaries shall be entered in the vehicle history book and records shall be completed.

10. FAULTS

10.1 Mechanical Faults — If instructions given in **11** and **12** are followed carefully and regularly, there should be no major mechanical defect on the fireground. However, minor defects may sometimes occur and the driver-operator should be able to trace the fault and rectify it on the spot.

10.1.1 The driver-operator shall thoroughly study the electrical, fuel and lubrication system of the engine, with particular reference to the fault-tracing chart, normally given in the instruction manual, till he becomes fully conversant with these.

10.2 Other Faults

a) Mechanism will not start — operator should check that power take off gear and transfer gear if it is or engaged correctly.

b) Mechanism operators power lever is engaged.

c) Mechanism continues to operation when levers are returned to neutral.

d) Faults during extension.

e) Faults during housing.

f) Faults during training.

g) Plumbing faults.

h) Failure of impact control.

j) Ladders bend side ways.

11. LADDER TESTS

11.1 Turntable ladders shall be examined and tested by a trained operator monthly, after use at fire and on such other occasions as are considered necessary.

a) *Ladder Pawls* — To see that they function correctly.

b) *Cables* — Should be inspected for wear.

c) Sheaves and guides shall be checked for free running.

d) *Ladder Tests*

   1) *Load test* — The unloaded ladder should be elevated to 40 degrees in line with the chassis, over the bonnet and extended to the maximum permissible extension for one-man loading. When in this position, the weight of two men should be gradually applied to the rescue line attached to head of the ladder.

   2) *Cut-out tests* — After the load test, the unloaded ladder should be rehoused and extended again at the same elevation (40

degrees) to the normal cut-out point for the particular ladder. If the cut-out fails to operate at his point the ladder should be extended a further one pawl position only, and if the cut-out is still not operating, extension should be stopped. The ladder should then be elevated to 75 degrees and extended to maximum extension in order to test the maximum extension cut-out (this test should be carried out in reasonably calm weather).

3) *Mechanism test* — The load and cut-out test procedure will automatically check all ladder operations except training and plumbing. The ladder should therefore be trained through 180 degrees and back again, and at the same time the satisfactory operating of the plumbing gear should be checked.

e) *Safety Belts* — Safety belts should be tested at the same time as the turntable ladder by buckling up the belt, clipping the hook on to a ring bolt or other immovable object and submitting the belt to the weight of two men suspended from it. Belts should then be carefully examined for any signs of perishing. Any belt showing undue signs of wear should be sent for repairs.

f) *Rescue Slings* — Rescue slings should be tested by securing the ring on to ringbolt or other immovable object and submitting each loop of the sling to the weight of three men suspended from it. The slings should then be carefully examined for any signs of wear.

g) *Guy Lines* — Guy lines should be tested and inspected monthly and after use at a fire. One end of the line should be secured and two men should apply a steady pull as near as possible to the free end of the line. This should be maintained for about 30 seconds and then reversed and the test repeated. On completion of the test the line should be carefully inspected for evidence of deterioration, and that the whippings, splices and fittings, such as snap hooks, etc, are free from defects.

11.2 General — The turntable ladder shall be examined, special attention being paid to the following:

a) That moving parts are clean and adequately lubricated;
b) That cables show no sign of excessive kinking or needling;
c) That pulleys are running freely;
d) That ladder parts are operating correctly;
e) That the axle-locking mechanism is functioning correctly;
f) That load indicators of the dial type are operating correctly;
g) That communications equipment is functioning correctly; and
h) That on hydraulically-powered ladders, there are no fluid leaks from the mechanism or from hydraulically operated jacks (where fitted).

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